

# Advanced magnetic spectroscopies for the fine characterization of magnetic nanomaterials

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In this talk I will show how the combination of XMCD and RIXS-MCD spectroscopies can allow a deep understanding of the electronic and magnetic structures in complex magnetic nanomaterials such as bimagnetic core-shell nanoparticles, and reveal emergent properties [1]. Questions related to core-shell interdiffusion and the distribution of magnetic anisotropies inside nanoparticles can be answered from measurements combined to Ligand Field Multiplet calculations and from XMCD / RIXS-MCD-detected magnetization curves [2,3]. In addition, I will discuss the possibilities offered by RIXS-MCD using a new liquid cell dedicated to the *in-situ* measurements of liquid and frozen ferrofluids, which allows preserving the nanoscale magnetic dipole interactions responsible for magnetically driven macroscopic properties used in numerous applications.

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[3] A. Juhin, A. López-Ortega, M. Sikora, C. Carvallo, M. Estrader, S. Estradé, F. Peiró, M. D. Baró, P. Saintavit, P.Glatzel, and J. Nogués, *Nanoscale* **6**, 11911-11920 (2014).